February 2016
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MPA Materials Matter

INSIDE

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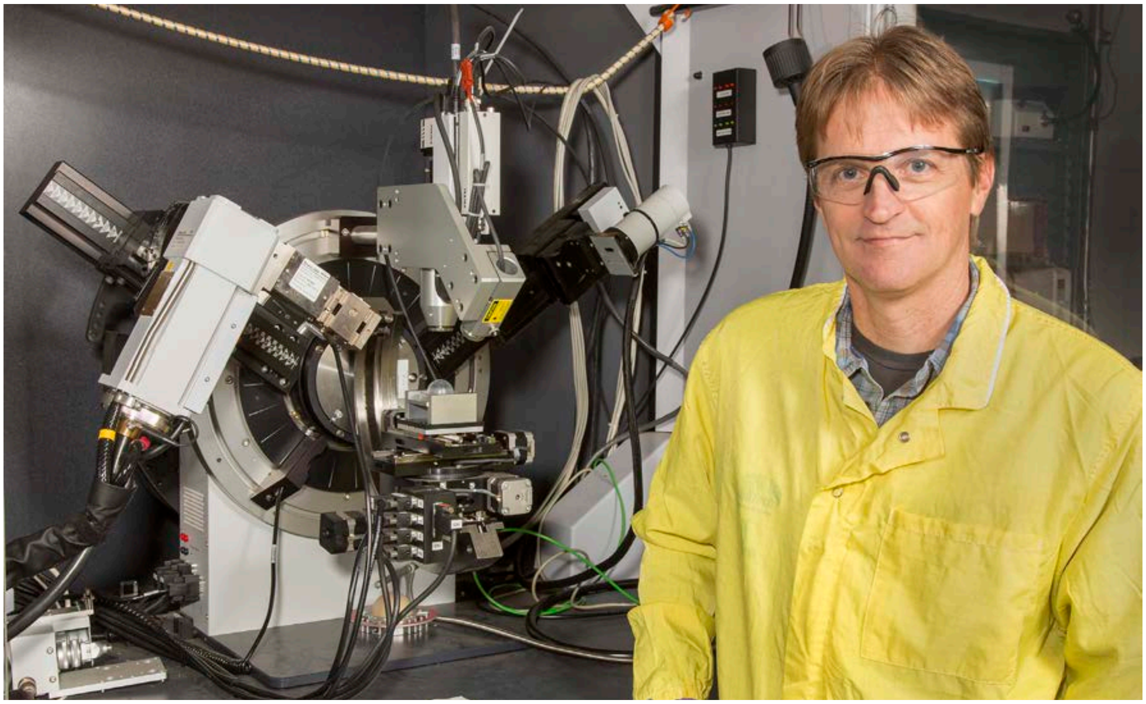

Loaded with a plutonium sample, this x-ray diffractometer at Los Alamos is a rare capability allowing chemist Brian Scott and his MPA-11 team to analyze radioactive materials for national security research.
Photo by Richard Robinson, NIE-CS

"Making new materials and characterizing them, and then using them to figure out some of these national security problems is rewarding to me."

Brian Scott

Providing materials synthesis and characterization for national security needs

By Diana Del Mauro, ADEPS Communications

Making gunpowder for backyard experiments was one of Brian Scott's favorite pastimes as a youngster in Idaho. In those days, potassium nitrate, a key ingredient, could be purchased at the pharmacy, and his father was supportive of his hobby.

Now, he's a chemist (Materials Synthesis and Integrated Devices, MPA-11) working with materials few people can. The Lab's national security programs, as well as the Atomic Weapons Establishment and Lawrence Livermore National Laboratory, look to Scott to make thin films coated with radioactive materials, which are important for materials aging studies as the United States and the United Kingdom modernize their nuclear weapons.

Demand for Scott's expertise soared as researchers worldwide heard about polymer-assisted deposition (PAD), a Los Alamos-developed method for making thin films. PAD has opened the door for new experiments because a small amount of radioactive material, like 25 micrograms, is sufficient. More facilities can accept the samples because the

continued on page 4

From Jeff's desk . . .

We are already into the second quarter of FY16 and a month into the calendar year, and as always, there are a lot of changes taking place. I would like to talk about just a few that affect MPA-11 and MPA Division.

The first is a major upgrade project at the Los Alamos Research Park building (SM-4200, aka "The Motorola Building" for those of you who have been around since the early 2000s) in Suite 100, which had been the main site of the former Superconductivity Technology Center's (MPA-STC) scale-up labs. Kathryn Berchtold's Carbon Capture and Separations for Energy Applications (CaSEA) team moved into this space almost four years ago and never had quite enough lab space for all their equipment and experiments. Several years in the planning, the upgrade project in Suite 100 began last November and was completed in January. A new lab was created from much of the former lobby and an office (one I actually occupied for a number of years). This lab now has new casework and a hood that will help ease the growing pains of the CaSEA team. In addition, a large walk-in hood was installed in an existing lab and many ventilation drops were added for gas cabinets and other equipment. The test and balance of the ventilation system was completed the last week of January and equipment is starting to be moved back into the labs. In the near future, once all is back up and running again, we will be happy to show you around our upgraded space. In addition, MPA-11 now occupies Suite 201, on the second floor of the Research Park building, across from the large conference room. There we have a lab for electromagnetic research and two (principally optical) characterization labs of Aditya Mohite's and Gautam Gupta's Light to Energy team. Let us know and we can also give you a tour of these labs.

"*. . . as always, there are a lot of changes taking place.*"

We have changes in the membership of our MPA Worker Safety and Security Team (WSST). Gautam Gupta (MPA-11) will be the new chair of the WSST. Team members will be Chris Romero (MPA-11), Reg Rocha and Han Htoon (both MPA-CINT), and Marcello Jaime (MPA-CMMS) with a second MPA-CMMS member to be decided. I serve as the back-up chair for the team. I, and the rest of the MPA management team, would like to thank retiring members Jen Martinez (MPA-CINT and chair) and Boris Maiorov (MPA-CMMS) for their service to the team and the division. In the future, please look for the solutions teams led by the WSST in your work areas. They are there to help solve problems you might have in performing your work. Contact them at any time for assistance.

The last week in January there was also a change in the way facilities are managed. In the new model, there will be one person, an Operations and Maintenance Coordinator (or OMC), where in the past these functions were split. There will also be new personnel supporting facilities in many of our areas. I, or the other MPA managers, will help to ensure your facility-related issues continue to be addressed.

Finally, a new Work Management System is set to go live Feb. 8. It has some very cool features, but there is also a learning curve. Some of our admins and I have taken the training and will be able to help you with this system when your integrated work document comes up for renewal.

Jeff

MPA Chief of Staff and MPA-11 Deputy Group Leader Jeff Willis

From Alex's desk

Colleagues,

It is with great pleasure that I write this note as the acting Center for Integrated Nanotechnologies (CINT) deputy group leader. It is great to be back to TA-3 and close to the materials community where I started my Los Alamos National Laboratory tenure many moons ago.

Long ago, I had the great opportunity to attend one of the first meetings between my colleagues and the DOE Office of Science during the early stages of establishing the five DOE nanocenters. This was with Don Parkin, who at the time was director of the Laboratory's Center for Materials Sciences. Don, now retired, by the way, played a pivotal role in bringing the National High Magnetic Field Laboratory to Los Alamos. It was indeed an exciting time. Now CINT has grown to be a well-established program with talented staff and world-leading capabilities. And, I'm doing my best to get to know CINT staff at TA-3 and TA-35, their science, the user program, and our collaboration with Sandia National Laboratories

This is a very important year for CINT. We are in the process of preparing for the DOE Office of Science triennial review. The proposal preparation, coordination with the CINT core at Sandia, and many other activities are intensifying and there is a great deal of hard work taking place and excitement going around. The way I see it, this is a great and exciting time to appreciate past and current scientific successes and user outreach, in addition to thinking broadly about future capabilities.

Let me also take the opportunity to talk about MaRIE, the Laboratory's proposed experimental facility for the study of Matter-Radiation Interactions in Extremes. A lot of activities are taking place!. In addition to the current CINT involvement, which is significant in a couple of MaRIE-related science challenges, there is great deal of potential for significant collaborations in the future.

In short, an exciting time for the materials community at Los Alamos.

Acting MPA-CINT Deputy Group Leader Alex Lacerda

"*The way I see it, this is a great and exciting time to appreciate past and current scientific successes and user outreach, in addition to thinking broadly about future capabilities.*"

Scott cont.

plutonium is non-dispersible, and the risk of radioactive release is low.

Quanxi Jia (Center for Integrated Nanotechnologies, MPA-CINT) invented PAD for non-radioactive materials, and Laboratory researchers Tony Burrell and Mark McCleskey adapted PAD to make uranium dioxide and triuranium octoxide, with Scott characterizing the films' structures using x-ray diffraction. Soon, Scott took over the Lab's PAD capability for actinides.

Offering easy setup and low cost, PAD involves dissolving the actinide of choice in a polymer, spin coating a thin film with the solution, baking the film, and measuring the crystallographic structure.

"Making new materials and characterizing them, and then using them to figure out some of these national security problems is rewarding to me," Scott said.

For the first time researchers are creating fissions in a cubic-phase plutonium dioxide film, using cold neutrons at the Los Alamos Neutron Science Center. As pieces of plutonium dioxide fly off the one-inch round film, the plutonium dioxide crystal structure is altered. These structural changes are key to understanding aging mechanisms in materials, which may cause changes in behavior. The findings are relevant to nuclear weapons, nuclear forensics, and nuclear power.

When the U.S. Department of Homeland Security asked Los Alamos to see how chemical signatures could enhance analyses in nuclear forensics, principal investigator Marianne Wilkerson (Nuclear & Radiochemistry, C-NR) enlisted Scott. His expertise in powder x-ray diffraction and thin films was vital, but from past collaborations, she knew Scott would offer new experimental approaches and broader interpretations across the project's measurements and data. In particular, PAD plutonium dioxide materials provided a useful approach for initiating experiments with plutonium.

This team is studying the actinide's reactivity under controlled conditions of temperature and humidity. Every few months they examine the stored samples, looking for changes in structure using a suite of spectroscopic techniques. As observed with uranium oxide powders, the chemical signatures of plutonium oxide materials could provide clues as to how the material was made and where it was stored. The research is promising and ongoing.

After completing his PhD in physical chemistry from Washington State University in 1990, Scott began his career as a Los Alamos postdoctoral researcher fascinated by the natural symmetry of crystal structure. He spends half his time performing basic research on materials synthesized across the Lab and has authored more than 380 papers with 8,000 citations. In 2004, the Lab honored him with a Distinguished Performance Award for creating an x-ray diffraction and molecular modeling capability.

Scott said he was drawn to a career in chemistry because it's a hands-on way to solve practical problems, but he never imagined how significant his work could be to the nation and its allies. "Where the world is headed, and what the world has become—working on those problems has become more and more important," he said.

Brian Scott's favorite experiment

What: Discovering how beryllium binds to human antibodies known to be involved in chronic beryllium disease

Why: Understanding this was important to the Department of Energy due to the wide use of beryllium in the weapons complex

When: Early 2000s

Where: Synthesis, x-ray diffraction, and molecular modeling capabilities in MPA-11 and nuclear magnetic resonance facilities in Bioscience Division.

Who: Nan Sauer (Chemistry, Life & Earth Sciences, ADCLES), Mark McCleskey (Chemistry, C-DO), Deb Ehler (retired), Tim Keizer (now Nalco Company), Brian Scott, and Ryszard Michalczyk (Bioenergy and Biome Sciences, B-11)

How: We had previously discovered, through the synthesis and characterization of small molecule biological mimics, that beryllium replaced the H+ ion in strong hydrogen bonds. We exposed apo and holo transferrin to beryllium sulfate and monitored the binding using beryllium-7 nuclear magnetic resonance spectroscopy.

The "a-ha moment:" Apo and holo transferrin bound 12 and 7 beryllium dications, respectively, in exact agreement with the number of known strong hydrogen bonding sites of each. Subsequently, we were able to expose an active antigen binding groove portion of one of the chronic beryllium disease antibodies to beryllium sulfate, and our binding model was confirmed—a major step toward developing a treatment.

MPA staff in the news

Terry Holesinger honored by NMBSA

The New Mexico Small Business Assistance (NMBSA) Program has honored the work of Laboratory researcher Terry Holesinger (Materials Synthesis and Integrated Devices, MPA-11) as a success story, recognizing his project that provided technical support for a Santa Fe business.

Holesinger was principal investigator for research with iBeam Materials. Light-emitting diodes (LEDs) are limited by substrates that are small, rigid, and complex. The iBeam technology, developed with contributions from Los Alamos and Sandia national laboratories, enables the creation of LEDs directly on flexible, large-area, and low-cost metal foils. Holesinger performed scanning electron microscopy and scanning transmission electron microscopy characterization of iBeam's gallium nitride samples for LEDs. This information assisted iBeam with process optimization of its highly engineered samples. The company intends to target the horticulture lighting industry first and then expand into other lighting and display markets.

In 2000, the New Mexico State Legislature created the Laboratory Partnership with Small Business Tax Credit Act for the purpose of "bringing the technology and expertise of the national laboratories to small businesses in New Mexico to promote economic development in the state, with an emphasis on rural areas." During 2014, NMSBA helped 352 small businesses across the state reach business goals, develop their products for commercial use, and increase profitability.

Technical contact: Becky Coel-Roback

Piotr Zelenay named Laboratory Fellow

Piotr Zelenay (Materials Synthesis and Integrated Devices, MPA-11) has been selected as a 2015 Los Alamos National Laboratory Fellow. "The Laboratory Fellows Organization recognizes researchers for innovative scientific and technical advances in their respective fields," said Laboratory Director Charlie McMillan. Carlos Tomé (Materials Science in Radiation and Dynamics Extremes, MST-8), Michael Bernardin (Weapons Physics, ADX), and Avadh Saxena (Physics of Condensed Matter and Complex Systems, T-4) were also named Fellows.

"The exciting work by Michael, Avadh, Carlos and Piotr exemplifies the essential science we do at Los Alamos that helps enable continuing success in our national security mission," McMillan said. "I commend each of them for this prestigious achievement."

Zelenay, who joined the Laboratory in 1997, has made sustained contributions in the field of catalysis. His discovery of non-platinum group catalytic activity is a well-recognized advance in fuel-cell technology. He has headed a large, sustained effort in fuel-cell technology supported by the DOE Office of Energy Efficiency & Renewable Energy since 2007, forming a cornerstone of Los Alamos's successful fuel cell program, and spinning off next-generation energy technologies. His continued high-level achievement is reflected in more than 150 publications with 6,700 total citations, as well as 18 patents in process or granted. His work is generally considered among the best worldwide; for example, his *Nature* paper on non-platinum group catalysis has more than 800 citations.

The selection committee ranked this year's nominations on the basis of the following:

- sustained, high-level achievements in programs of importance to the Laboratory;
- a fundamental or important discovery that has led to widespread use;
- having become a recognized authority in the field, including outside recognition and an outstanding record of publications.

Established in 1981, the Fellows organization comprises technical staff members appointed by the Laboratory Director in recognition of their sustained outstanding contributions and exceptional promise for continued professional achievement. Limited to 2 percent of the Laboratory's technical staff, Fellows advise management on important issues, promote scientific achievement, and organize symposia and public lectures. The organization administers the annual Fellows Prize for Outstanding Research in Science or Engineering and the Fellows Prize for Outstanding Leadership in Science or Engineering.

Technical contact: Piotr Zelenay

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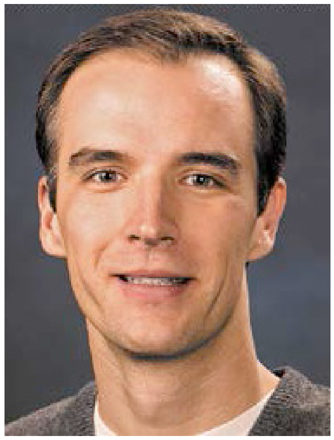
Staff cont.

Sheu



Ramshaw

Yu-Miin Sheu and Brad Ramshaw receive Los Alamos National Laboratory Postdoctoral Publication Prize

Yu-Miin Sheu (Center for Integrated Nanotechnologies, MPA-CINT) and Brad Ramshaw (Condensed Matter and Magnet Science, MPA-CMMS) have won Laboratory Postdoctoral Publication Prizes in Experimental Sciences. Damon Giovanielli and Los Alamos National Laboratory sponsor the award to recognize the value and scientific contributions that postdocs make to the Laboratory. The Prize honors the best article in experimental sciences that has been published or accepted for publication. The publications reflect experimental research in the physical, chemical, or biological sciences performed primarily during the tenure of the postdoc's appointment.

Sheu won first place for her publication, "Using Ultrashort Optical Pulses to Couple Ferroelectric and Ferromagnetic Order in an Oxide Heterostructure," *Nature Communications* **5**, 5832 (2014). Magnetoelectric multiferroic materials possess both ferromagnetic and ferroelectric order. Sheu used femtosecond time-resolved second harmonic generation optical measurements to unravel magnetoelectric coupling in a ferroelectric/ ferromagnetic oxide heterostructure. These first ultrafast optical measurements on the heterostructures reveal the intrinsic timescales that limit operating speed and demonstrate that ultrashort optical pulses can control the coupling between two different order parameters. The paper provides insight on the mechanisms underlying magnetoelectric coupling in complex oxide heterostructures and suggests the potential for future high-speed optically controlled magnetoelectric devices. Sheu is now an assistant professor in the Department of ElectroPhysics at Chiao Tung University, Taiwan.

Ramshaw won second place for his publication, "Quasiparticle Mass Enhancement Approaching Optimal Doping in a high-Tc Superconductor," *Science* **348**, 317 (2015). The paper reports long-sought experimental evidence of the link between the quantum criticality and exotic high-temperature superconductivity. This result represents a major advance in the study of the high temperature superconducting cuprates, one of the central problems in condensed matter physics. The finding is a key milestone in the eventual understanding of the physics of high-temperature superconductivity. Ramshaw is the sole corresponding author of this paper. He became a Lab staff scientist at the National High Magnetic Field Laboratory in 2015.

Damon Giovanielli, retired division leader of the Lab's Physics Division and current president and director of Sumner Associates Consulting Firm, sponsors the Publication Prize in Experimental Sciences. The Postdoctoral Program Office administers the award competition.

Technical contact: Mary Anne With

New surface studying capabilities at Lujan Center

Asterix neutron spectrometer probes chemical evolution of surfaces and thin films in variety of physical and chemical environments

Recent modification to the Lujan Center's polarized neutron reflectometer, Asterix, has created a new set of experimental capabilities. The alterations enable comprehensive characterization of chemical and structural properties of the surfaces of materials of importance and experimental environments to control the investigated surfaces' hydration, oxidation, temperature, and pressure to mimic a wide range of field conditions.

The instrument's conversion into a versatile nanoscale and mesoscale neutron scattering beamline by Erik Watkins (Materials Synthesis and Integrated Devices, MPA-11),

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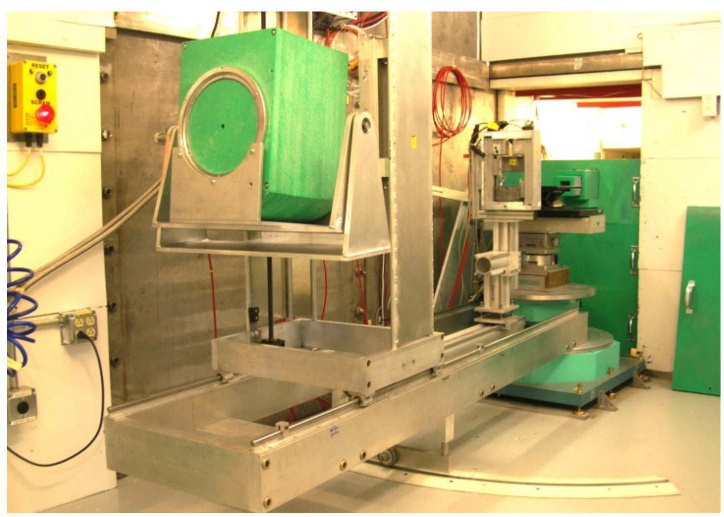

Figure 1. A photo showing parts of the completed modifications (a new detector gantry and sample positioning mechanism), which allow vertical scattering geometry.

Asterix cont.

Jarek Majewski (Center for Integrated Nanotechnologies, MPA-CINT), and Mark Taylor (Engineering Services for LANSCE Facility Operations, ES-LFO) allows Asterix to perform horizontal and vertical surface scattering geometries. For example, its horizontal sample geometry allows handling of heavy and bulky sample environments required to investigate thin layers and bulk material surfaces in extreme environments. This capability may also be applied to study low-rate kinetics, like surface oxidation or evolution in a corrosive environment.

The modification also provides a possibility to address so-called “off-specular” scattering from the samples. Off-specular data provide the neutron intensity distribution as a function of the neutron momentum transfer vector parallel to the sample’s surface. This information can provide additional insight into in-plane correlations of the surface and interface structures. For example, such data can address correlations between the roughness of different interfaces, corrosion-induced pitting processes, and the growth or phase separation of in-plane islands.

Surfaces and interfaces play a major role in material properties and frequently determine the behavior of bulk materials and their aging. They are especially important in determining the behavior of soft- and condensed matter nanostructured materials, such as metallic surfaces, polymer composites, multilayer structures, bio-related systems, etc. Experimentally investigating interfaces presents significant challenges. Interfaces are often buried within the material, accessing them therefore frequently requires destructive characterization or extensive sample preparation methods, such as for transmission electron microscopy or atom probe tomography. Despite many recent developments, interface structure and properties remain poorly understood, in part due to a limited experimental toolbox for their characterization.

Neutron scattering offers unique opportunities for studying interfaces due to the high penetration depth of neutrons and the non-monotonic dependence of their scattering cross-sections on atomic numbers. For example, interfaces in metals typically have low thickness; indeed, some are atomically sharp. Thus, understanding interfacial phenomena requires high—sometimes ångstrom-level—spatial resolution. Moreover, certain interfaces only exist at high temperatures and pressures or under contact with external media, such as gases or liquids. Frequently, investigating such interfaces requires special techniques and in situ characterization methods, which are at the core of MaRIE, the Laboratory’s proposed experimental facility for the study of Matter-Radiation Interactions in Extremes.

In surface sensitive scattering methods, a neutron beam strikes a flat sample at a small angle of incidence (or a particular value of the momentum transfer vector, Q) and

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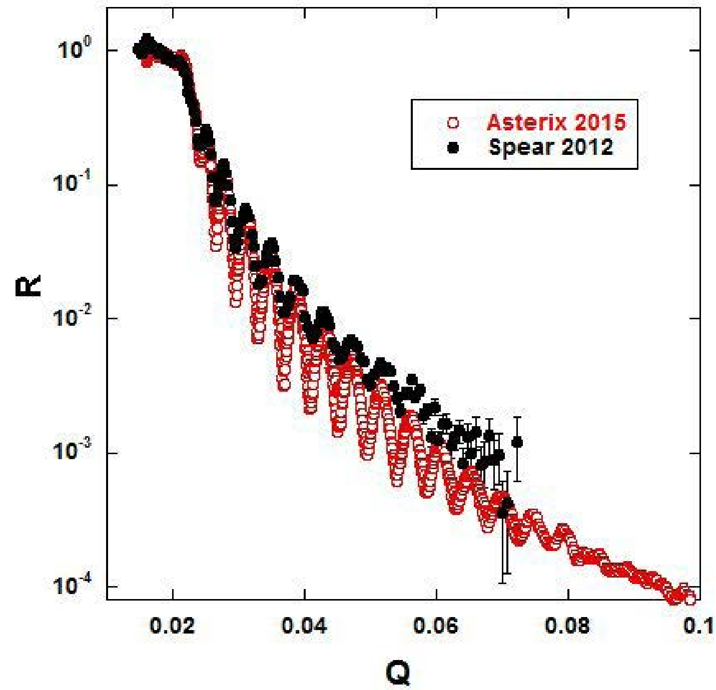
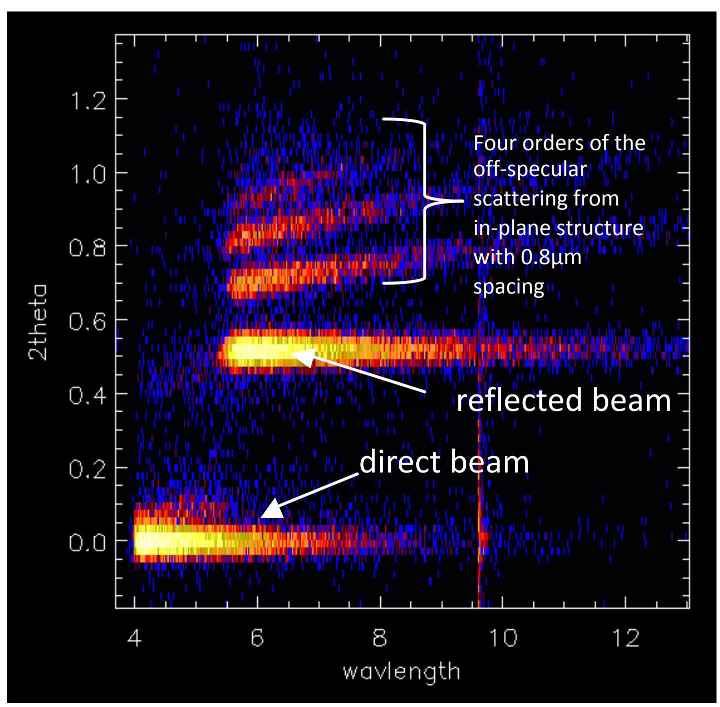


Fig. 2. Comparison of neutron reflectometry from approximately 140 nm of Ni deposited on a quartz substrate obtained from Asterix (red) and previous Lujan Center spectrometer SPEAR (not currently in use). Higher resolution and bigger momentum transfer vectors Q are measured at Asterix.

Fig.3. Off-specular neutron scattering measured on Asterix demonstrates the possibilities to address the in-plane structures with ~μm spacings. In this case, the scattering originated from linear groves with 0.8 μm spacing.



Asterix cont.

can undergo reflection, transmission, or refraction at various interfaces within the sample. Consequently, the intensity of the outgoing, scattered neutron beam differs from that of the incident beam. This difference—measured as a function of Q—encodes information about the physical structure and composition of the surface or interfaces.

Mechanical and data reduction modification and upgrades are complete and Asterix has been commissioned fully functional (Fig. 2 and 3). Future plans call for installation of small angle scattering (SANS) and grazing incidence small angle scattering (GISANS) capabilities.

With that completed, Asterix will be one of the most versatile neutron surface scattering spectrometers in the complex, allowing a wide range of scattering—from material surfaces and bulk materials—to be performed.

The capability supports the Laboratory's Stockpile Stewardship Mission and will support FY16 scope funded by the Science Campaigns, Program Manager Steve Sterbenz. Additional support was provided by Don Brown, Ellen Cerreta, Rick Martineau, Joseph Martz, Steve Sterbenz, Ross Muenchausen, and Gus Sinnis.

Technical contacts: Erik Watkins and Jarek Majewski

Experiments reveal possibility of polaronic Bose-Einstein condensates in $UO_{2(+x)}$

A research team used ultrafast terahertz spectroscopy and microwave dissipation to identify potentially definitive evidence for a polaronic Bose-Einstein condensate (BEC) in photo- and chemically doped uranium oxide [$UO_{2(+x)}$]. The evidence implies a state of matter with potential exotic properties. A macroscopic quantum object created by chemical doping (or equivalently, by photodoping through ultrafast laser excitation) persisting to ambient temperature and residing in a bulk solid would be revolutionary in a number of scientific and technological fields because the material could be controlled or "tuned" for specific functionalities. *Scientific Reports* published their findings.

Scientists discovered the Bose-Einstein condensate, a state of matter, in 1995, and included it with solid, liquid, gas, and plasma as the coldest and most sluggish of the group. In new work, a team made Bose-Einstein condensates with polarons, a type of quasiparticle, and observed concomitant high mass and temperature, up to 300 K. This result indicates a novel coherence mechanism.

That some of the signatures of coherence in an atom-based system extend to ambient temperature suggests a novel mechanism that could be a synchronized, dynamical, disproportionation excitation that promotes the coherence. Such a mechanism would demonstrate that the use of ultra-low temperatures to establish the Bose-Einstein condensate energy distribution is not a necessity and for the particles to be in the same state is attainable by other, perhaps less-challenging means.

The researchers performed ultrafast terahertz spectroscopy at the Laboratory for Ultrafast Materials and Optical Science at Los Alamos, part of the Center for Integrated Nanotechnologies, a DOE Office of Science user facility. Building on previous research on the chemically and photo-doped, partly filled 5*f* Mott insulator $UO_{2(+x)}$, the team performed optical pump-terahertz time domain spectroscopy to reveal the coherence that is a defining characteristic of a conden-

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Celebrating service

Congratulations to the following MPA Division employees celebrating service anniversaries recently:

Jon Baldwin, MPA-CINT .... 10 years
Paul Dowden, MPA-CINT .... 25 years
Julie Garcia, MPA-11 .... 10 years

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To submit news items or for more information, contact Karen Kippen, ADEPS Communications, at 505-606-1822 or kkippen@lanl.gov.
To read past issues see www.lanl.gov/orgs/mpa/materialsmatter.shtml.

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Polaronic cont.

sate. They also examined microwave absorption spectra that exhibited dissipation and some broad, complicated, highly temperature-dependent vortex-like features, but much lower radio frequency energies attributed to the lower stability of the condensate. The experimental evidence points to identifying the condensate as mesoscale bosons composed of phase coherent fermionic polarons formed from charge defects in the lattice. The surprising aspect of these quasiparticles is their persistence at ambient temperature despite the dynamical interplay of charge transfer between the condensate and the massive uranium lattice ions.

The work is an example of science that could benefit from a high time-resolution facility like MaRIE, the Laboratory's proposed experimental facility for Matter-Radiation Interactions in Extremes. Researchers could use MaRIE's x-rays to study polaronic-based Bose-Einstein condensate collective response with direct access to polaron lattice coupling information via x-ray scattering in a time resolved manner to yield complementary dynamics as done with terahertz spectroscopy.

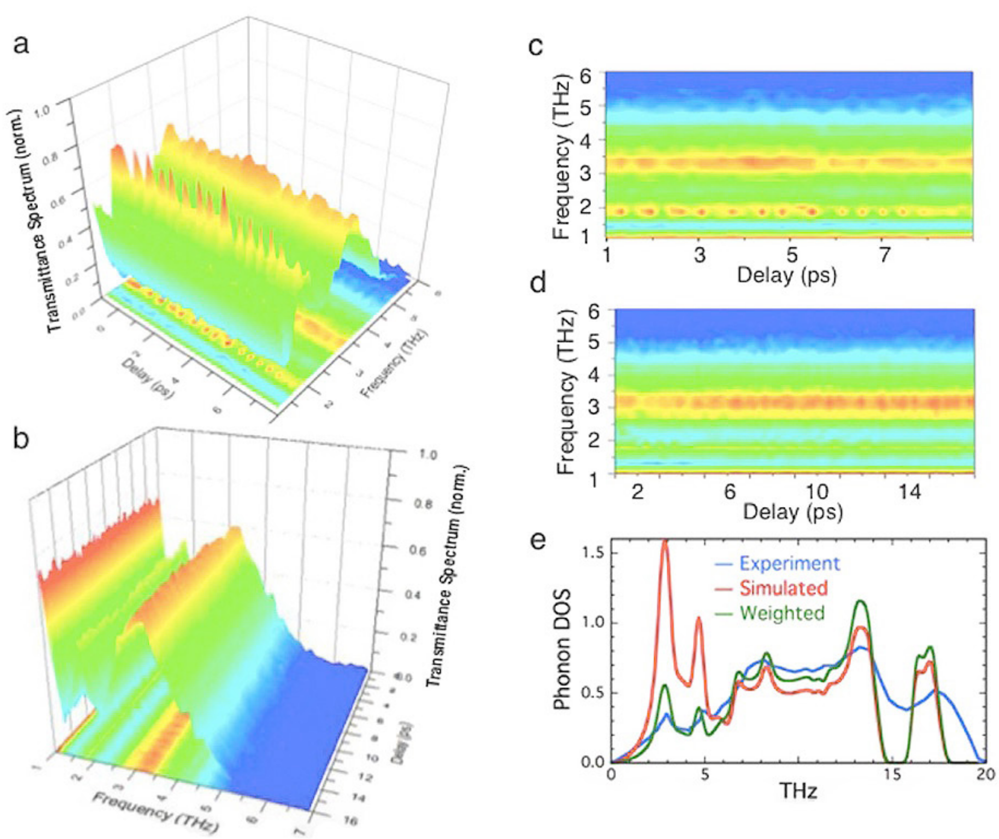
Reference: "Possible Demonstration of a Polaronic Bose-Einstein (-Mott) Condensate in $UO_{2(+x)}$ by Ultrafast THz Spectroscopy and Microwave Dissipation," *Scientific Reports* **5**, 15278 (2015).

Authors: Steven Gilbertson and George Rodriguez (Center for Integrated Nanotechnologies, MPA-CINT); Tomasz Durakiewicz (Condensed Matter and Magnet Science, MPA-CMMS); Alan Bishop (Science, Technology and Engineering, PADSTE); David Andersson, Darrin Byler, and James Valdez (Materials Science in Radiation and Dynamics Extremes, MST-8); lead author Steve Conradson (formerly of MST-8, now Synchrotron Soleil in France); and collaborators from the University of Rochester and Uppsala University. J.D. Thompson (MPA-CMMS) performed magnetic susceptibility measurements.

The Laboratory Directed Research and Development program and the DOE Office Science, Basic Energy Sciences, Materials Sciences and Engineering and the Chemical Sciences, Biosciences, and Geosciences Divisions funded different aspects of the Los Alamos work.

The research supports the Laboratory's Energy Security mission area and the Materials for the Future science pillar by demonstrating pathways to controlled functionality and providing understanding of actinide oxide fuels.

Technical contact: George Rodriguez



Time evolution of optical pump-terahertz time-domain spectroscopy probe experiments. (a) Frequency of the normalized transmission as a function of time up to 8 ps following excitation at 1.57 eV. Regular modulation of the amplitude on top of the peak at 1.8 THz is apparent. (b) Frequency as a function of time following excitation at 3.14 eV, across the Mott gap, which does not show oscillations. (c/d) Overhead views of (a/b), with the colors representing the same amplitude of the normalized transmittance. (e) Calculated and experimental phonon density of states.

HeadsUP!

ADEPS Environmental Action Plan for FY16

ADEPS remains committed to managing its environmental impacts with forethought and action. Our 2016 Environmental Action Plan was developed from an overarching review of the potential impacts of our work activities and identifies certain, concrete steps we can take to decrease the potential for, and severity of, any environmental damage from our work.

We remain focused on three areas: *Clean the Past, Control the Present*, and *Create a Sustainable Future*. These objectives parallel Los Alamos National Laboratory institutional objectives, with the specific targets fine-tuned to fit our directorate.

Clean the Past: Reduce environmental risks from historical operations, legacy and excess materials, and other conditions associated with activities no longer a part of current operations.

Target 1: Continue salvaging and recycling surplus equipment, materials, etc.
Action 1: Reduce, salvage, and recycle
Action 2: Transportainer assessment, clean-out, removal
Action 3: Combined effort: MPA/MST clean-up of rad-contaminated vacuum pumps and other legacy items from 03-34
Action 4: Transfer hazardous chemicals from LANSCE to ORNL-SNS and dispose of the rest of the hazardous chemicals from 53-015.

Target 2: Identify and execute ADEPS Footprint Reduction Project
Action 1: Relocate occupants, supplies, and equipment from 53-044, 53-045, 53-046, and 53-047 such that these buildings can be readied for D&D via the LFO-FOD.

Control the Present: Control and reduce environmental risks from current, ongoing operations, missions, and work scope.
Target 1: Annual: One environmental MOV per manager per quarter

Target 2: Annual: Communicate EAP and EMS information to directorate staff
Action 1: Ample use of posters, division newsletter articles, group meetings
Action 2: Integrate ADEPS EMS EAP message with ADEPS WSST Team
Action 3: Host a “zero waste” meeting or event

Target 3: Annual: Maintain control of chemicals
Action 1: Annual chemical inventory with 95% goal for each ADEPS division
Action 2: Utilize LANL chemical re-use resources (ChemDB & Chemicals eStockroom)

Target 4: Submit projects or work improvement activities for P2

Create a Sustainable Future: Ensure mission is entwined with effective environmental stewardship
Target 1: Sponsor or participate on building a “Green Team”
Action 1: Participate on the 03-1415 Green Team

Target 2: Incorporate MaRIE planning to include future potential environmental hazards and mitigations on our 2.10’s and 2.4

Additionally:
Each of us can contribute in small, but important ways, such as turning off lights in areas when not in use, calling attention to a leaking faucet or toilet so it can be fixed, turning off computer peripherals when not in use, and being attentive to purchases to support “green” procurements wherever possible. Other actions to consider are:
- Using the blue and green recycling bins.
- Sharing chemicals, minimizing chemical inventories, purchasing safer alternatives, recycling and disposing properly.
- Salvaging all unnecessary or unused (and not needed) equipment.
- Nominating a deserving colleague for a P2 Award!!

Please remember to let us know of any environmental actions so we can tally them in our end-of-year report. You can send information to any of the ADEPS Environmental Action Plan contacts:

ADEPS – John Gustafson, johngus@lanl.gov
MPA Division – Jeff Willis, jwillis@lanl.gov
MST Division – Dianne Wilburn, dianne@lanl.gov
P Division – Steve Glick, sglick@lanl.gov

The ADEPS plan in greater detail can be found at the LANL EMS web page at int.lanl.gov/environment/ems/index.shtml; then click on Tools - “EMS Action Plans.”

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